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AUTHOR Russell, Anne L.
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ABSTRACT

Learning to use technology can be traumatic for adults. This study is qualitative and based on personal e-mail diaries written by adult learners. It identifies six stages adults may go through as they learn to use technology to communicate electronically. Initially, 30 teachers studying in a post-graduate university course were involved in a compulsory assignment which required them to learn to use e-mail. They were asked to take the role of a character from a children's book and respond to letters from school children. In addition to e-mailing the children, each participant was required to send three e-mail messages, or metacognitive reflections, to their professor explaining how they were learning to use the technology. Six categories emerged from the diary reports and formed the stages which learners typically go through as they learn to use the technology: (1) awareness; (2) learning the process; (3) understanding and application of the process; (4) familiarity and confidence; (5) adaptation to other contexts; and (6) creative application to new contexts. Once the stages were identified, new students were introduced to the stages at the beginning of their on-line assignment. There were enough positive student reflections to indicate that computer anxiety was overcome at the completion of the task and at confirmation of the six stages. (AEF)

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Six stages for learning to use technology

Author:

Anne L. Russell
Queensland University of Technology

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ABSTRACT

Learning to use technology for adults can be traumatic. This paper describes six stages adults may go through as they learn to use technology to communicate electronically.

An action research model has been used to develop a strategy for adult learners to understand the stages they will go through as they learn to use electronic mail as a communication tool. There are two cycles in the study reported in this paper. First, is the identification and description of six stages learners go through asthe technology moves from being intrusive to becoming invisible. And secondly, is the application of metacognitive understanding of these stages by new naive adults learners as they use the technology.

When new technology learners apply the knowledge of these six stages to their learning, they appreciate they are not unique and inadequate in their ability to come to terms with the technology. In addition,teachers of technology who have knowledge of the six stages can identify the key times when they need toprovide intensive support with the knowledge thatthe learner will require less support during the later stages.

INTRODUCTION

Access to technology can "allow people separated by distance and time to occupy a shared synthetic world, where they can collaborate to evolved common virtual experiences" (Dede in O'Neil, 1995, p.11). In order for educators to keep up with, and to be actively involved in, national and international trends, it is an advantage to have the ability to communicate with colleagues across the globe. However, in the information age where the Internet may be a way of life for the young child, many adults find learning to use computer technology is very daunting. Adults who are not familiar with technology can feel left behind. Special attention needs to be given to ensure they learn without loosing self-esteem andwithout dropping out all together. Simonson, Maurer, Montag-Rorardi, & Whitaker, (1987) identified 'that a positive, anxiety free attitude toward computing was a necessary prerequisite of computer literacy' (p.233).

Researchers (Rosen, Sears,& Weil, 1993; McInerney, McInerney, & Sinclair, (1994) studied university students' levels of computer anxiety before and after taking computer courses. The type of computer course has been an important factor in reducing anxiety (Leso & Peck, 1992). However, reducing anxiety through learning computer applications using a relevant activity combined with an understanding of stages a learner typically goes through during the learning process has not been considered. Learning in this context represents the new understanding and skills which occur when technology hardware and the software processes move from being intrusive and frustrating to being invisible. This allows an individual to develop confidence and consider creative uses of the technology.

The study reported in this paper is qualitative and based on personal e-mail diaries written by adult learners. It focuses on the identification of learning stages in these students self-reports as they use e-mail for first time. The second phase of the study involved introducing the identified stages to a new group of students also learning to use e-mail.

Computer Anxiety

In the information age adults believe they should be computer literate. Many feel inadequate about their abilities to develop computer skills and actively avoid using computers. Evans-Andris (1995) observed elementary teachers and found:

Approximately, 62% of the teachers tended to engage primarily in distancing routines, limiting their involvement with computers, whereas approximately 38% of the teachers engaged primarily in embracing routines, increasing their opportunities to use the equipment. (p. 20)

Kolehmainen (1992) suggested computer anxiety will have negative effects when learning new technology because of a resistance to change. If this is so, it may be important to identify for learners a relevant purpose for learning which reflects and reinforces their current values. Involving students in a relevant task where the technological processes are merely a means to an end, may lead to overcoming computer anxiety earlier.

Rosen et al. (1993) and McInerney et al. (1994) found first-year university students in the 1990s to be computer anxious as they commence their compulsory computer studies. Both these studies reported many of the students still remained anxious at the completion of their computer course.

A computer literacy and computer anxiety test has been devised by Simonson et al. (1987) and has been used to measure the level of computer anxiety in university students before and after completing a computer course.

The type of computer course can have some influence on the level of anxiety of graduating students. Leso and Peck (1992) found students taking a software tool course (included word processing, spreadsheets, etc.) were more likely to come out with reduced anxiety than those students doing a programming course. However, the study did not explore the reason for this outcome. In fact, many students did not reduce their level of anxiety by the end of either course.

"Increased computer experience does not necessarily alleviate anxiety" is also reported by McInerney et al. (1994. p. 47). These authors suggested researchers focus "on building confidence and a sense of personal control in a non-threatening learning environment, individualized if necessary" (1994. p.47). It appears the processes of learning to use computers can cause a decrease in self-esteem.

Becoming Computer Literate

Being computer literate implies being able to use a computer and to apply current understanding to new situations. In relation to this paper, computer literacy refers to common hardware and software 'tools' programs and, in particular, using e-mail. In early computer experiences the hardware and software are intrusive. As the learner understands how to manipulate the computer, more control over the technology enables the focus to shift to tasks to be completed.

Valdez (1989) suggested that "technology should be the means by which teachers and students are able to feel more empowered and in control of their lives" (p. 38). He identified awareness, adoption and refinement/adaptation as "three stages that most people experience when learning to use technology" (p.37). The present study reports finding six stages which learners go through as the hardware and software processes move from intrusive to invisible.

Learning to use technology in this paper is presented from a constructivist perspective where learning occurs through immersing the learner in a real and relevant experience with collaborative faculty and peer support. The learner brings metacognitive understanding to the learning situation to help overcome some of the frustrations of learning and bring understanding to the task.

The learner constructs personal meaning through immersion in the situation and develops strategies for building an understanding of the practicalities of the technological processes. Apart from the physical presence of the technology there are other sources for help which range from printed manuals to faculty and peer support. The learner develops an understanding of how the technology operates and identifies the steps required to make it work in order to achieve success in the processes. The understanding will be such that the learner can accommodate flexibly when varied processes are required.

In the study reported here the students were given operation manuals, personal instruction, provided with faculty and peer support, but were encouraged to create their own mental schema and processes to understand the technology. This is carried out through the immersion in a real and relevant task which involves children from schools across Australia.

THE STUDY

Initially thirty teachers studying in a post-graduate university course were involved in a compulsory assignment which required them to learn to use e-mail. The vehicle for their learning was to take the role of a character from a children's fiction book and respond to letters from school children. This Characters-on Line Project during a three week period provided a service to Australian schools (Russell, in press). All communications took place using e-mail. In addition to e-mailing to the children, each student was required to send three e-mail message to their professor explaining how they were learning to use the technology. These messages, or metacognitive learning diaries, were sent at intervals throughout the learning experience.

Students came into the course with varying technological knowledge. While some had actively avoided using computers, others had practical experience in word-processing and school library automation activities. No student had previously accessed electronic mail.

Initially all students were on-campus attending university full-time. Over the following years the nature of the course changed and the majority of the post-graduate students became part-time external or open learning students, many of whom live in remote locations. They accessed e-mail and completed the project assignment with a borrowed modem from their home or at their local school.

Since the initial thirty teachers completed their e-mail assignment, some 400 students have repeated the process and e-mailed metacognitive reflections on their learning experiences. The e-mailed metacognitive reflections from students formed a pool of data which was analysed using grounded theory (Lincoln & Guba, 1985). Categories of metacognitive reflections on the experience of learning technological skills related to using electronic mail were identified. Six categories emerged from the diary reports and these formed stages which learners typically go through as they learn to use technology:

Stage 1: Awareness
Stage 2: Learning the process
Stage 3: Understanding and application of the process
Stage 4: Familiarity and confidence
Stage 5: Adaptation to other contexts
Stage 6: Creative application to new contexts.

In the second stage of the study these six stages were presented to new students as they commenced their email experience and learned to use the technology. These students were asked to reflect on their personal learning in relation to the identified six stages. This second aspect of the action research cycle validates the six stages as students reported similar feelings of frustration and success. This aspect will be explored after describing in more detail the six stages for learning to use technology.

PHASE ONE: STAGES FOR LEARNING TO USE TECHNOLOGY

The six stages learners usually pass through as e-mail technology moves from the intrusive to the invisible are described and supported by illustrations from metacognitive reports of the students.

Stage 1: Awareness

Here students are aware that electronic mail exists. Many students have actively avoided using computers and no student reported using e-mail prior to this compulsory activity. A sense of nervousness and fear was in the minds of some students while others were looking forward to having the opportunity to do something they had heard about.

I had no idea what was actually going to occur. I had heard of electronic mail, but had never seen it in operation. Because of this, I felt rather bewildered and to a certain extent concerned.

The very thought of such technology - computers, satellites, etc., was extremely daunting. I was also excited by the idea that I would have to be involved and get to know all about it.

Stage 2: Learning the Process

Reports of time-consuming assimilation of new information as new skills are mastered epitomizes this stage. Instructions are often misleading for the novice who does not understand the processes. Frustrations with complex technology renders the equipment intrusive in the eyes of the user. The technology can overpower and intimidate the learner.

Some students without extensive computer experiences, are afraid of damaging equipment. Others, in hindsight enjoy this challenge and persevere to ably move beyond this stage. Most students find working within a group is extremely valuable for

providing moral support. Apart from peer support, this stage requires extensive technical and positive encouragement from the teacher.

We experienced a variety of emotions: extreme frustration often when there appeared to be no logical explanation for things going wrong; annoyance about the amount of time wasted.

The handbooks were meaningless, until I had some 'hands-on' experience.

Those experiencing problems only had to ask and someone was sure to be there with a suggestion or hint.

Stage 3: Understanding and Application of the Process

As the learner begins to understand the logic behind the technological processes, the need to cling to step by-step instructions can be relaxed. Where early instructions had no meaning and were therefore forgotten, now the learners have 'hands-on' experience and they can accommodate new instructions within their basic understanding. The relevance of the task gives added incentive with a purpose to continue learning the processes. A sense of community is felt with the presence of peers who are also learning the processes and providing moral support.

After plodding through a couple of weeks, our knowledge of [e-mail] had increased and so, this time, some of the things began to makes sense, and suddenly we could see where we had gone wrong. The next attempt brought success!

Stage 4: Familiarity and Confidence

With confidence the technological processes are applied to the task at hand as the learner can visualize the processes and anticipate logical outcomes for certain software commands or apparent inconsistencies. The technology is starting to become transparent when problems become 'hiccups' rather than major distracters.

Sometimes there is a reversion to earlier stages, but confidence is more quickly regained. Self-esteem is increased as the learner is able to solve the problems through familiarity or logical analysis of the situation. Working things out alone give a sense of knowing, understanding and confidence.

By the beginning of the second week I could successfully work on [e-mail] without the use of the much valued manual - something I was quite proud of.

Having overcome the problems of operating the system efficiently, I could then concentrate on the process of the task: assuming the role of the character of Wilbur. This was one of the highlights. Being able to communicate with children and sharing with them their thoughts and feelings on the book " Charlotte's Web".

Stage 5: Adaptation to Other Contexts

Now the technology and software are invisible and the learner can see the potential for use of e-mail in other curriculum situations. New understandings and experiences are transferred to other contexts. For example, one student reports a new sense of confidence when she assists school children as they learn a word processing package she has not previously seen.

Now that I know how to operate the system, I hope that I will have the opportunity to work on future email] projects. As well, this time has also made it evident to me that I will need to become more familiar with computers and associated pieces of equipment, if I am going to incorporate them successfully into my resource centre.

Stage 6: Creative Application to New Contexts.

This stage is reached by students for whom the technological processes become invisible and who naturally use electronic mail to extend their educational environment when this is appropriate.

Several years after this initial contact with e-mail, some students have reported that the experience led themto become the computer coordinator in their school. Other students have sent future assignments via e-mail when this was not an expectation. Recognizing implications and possibilities for other uses of e-mail was also evident.

Electronic mail could provide deaf children with the facility to participate in the visual form of natural language with their peers. It would also widen the audience for outback students.

PHASE TWO: METACOGNITIVE APPLICATION OF THE STAGES

Once the six stages most students go through as they learn to use the technology were identified, new students were introduced to the stages at the beginning of their on-line assignment. The diary reports they send reflected their personal learning in relation to the six stages. The intention was to provide the opportunity for the students to articulate their personal learning strategies and also to validate the six stages as being applicable for learners of new technology.

My reflection on their metacognitive insights helped me to identify how better to assist these and future students as they learn new technological processes.

The following discussion epitomizes e-mail diaries of sixty students doing the Characters-on-Line Project in 1995. It should be acknowledged that some students may not like to admit their feelings of inadequacy. However there are sufficient positive reflections to indicate students' computer anxiety is overcome at the completion of the task and confirmation of the six stages for learning to use new technology.

A case study of Pat will be presented here with her references to the six stages as she was learning to use e-mail. Her insights were typical of the other students. The following message was sent to me six weeks after afive hour introduction and hands on training session during an on-campus session at the university. Pat is a full-time teacher-librarian (media specialist) living in a country town too far to return to the university for assistance in using e-mail. She was a member of the team who were took on the character of eight year old Jason from a picture book called Our Excursion by Kate Walker & David Cox (Omnibus Books). As "Jason", Pat replied to letters from school children across Australia.

Stage 1: Awareness

All my initial fears, phobias and woes seem long forgotten and I'm a bit sad to be saying good-bye to Jason and the [e-mail] kids. I jotted down a few notes regarding the six stages you propose. In Stage 1 I certainly had mixed feelings about what was going to occur. The best way to describe it I guess is that it was a strange mix of excitement and terror - do you know that feeling?

As I read the comments from students, I am conscious of their anxiety at the beginning of the project. Many have avoided using computers and others are afraid of the technology and the damage they will do to the hardware. These students need to have useful instructions, equipment that works andaccess to someone who knows the particulars of their computer setup. At the same time there are students who are confident and keen to extend their experiences with the technology.

Stage 2: Learning the process

I felt fairly confident when I left uni (how those other students managed with a phone workshop I'll never know - I guess I'm a hands on learner), but when I got home I had trouble setting up the system and our shared phone line crashed for a few day. It threw me and I lost confidence. In Stage 2 I was pretty much frustrated and impatient. I felt uncertain and suddenly all the instructions that had seemed clear at uni didn't seem to make sense.

Stage Two requires direct non-threatening assistance from someone who has knowledge of the student's individual computer setup. Preferably this is someone who is readily available on site or via telephone. It is this stage where I receive many phone calls for assistance. Observation of two naive learners sitting together at one keyboard is fascinating. The person at the keyboard seems to have an empty mind and the observer knows all the answers and steps in the process. They then

exchange positions and the empty minded person has all the answers as the former expert sits at the keyboard with an empty mind!

This stage requires confidence building. It is essential students do not feel or be made to feel stupid. A phrase I use often during this stage is, "The more mistakes you make the more you will learn." Permission and even encouragement to make mistakes is essential and acknowledges that others are equally unaware.

Stage 3: Understanding and Application of the Process

Stage 3 was reassuring because gradually things started to fall into place. Although I felt that I didn't know where my information was at any one time (cyberspace???? what is that ???) I gradually was coming to grips with the [e-mail] concept. I learned the hard way to be accurate.

Less help is required from experts at this stage. Often students turn to each other via e-mail or telephone for assistance. They build confidence as they help each other overcome problems. My presence is seldom sought.

Stage 4: Familiarity and Confidence

Stage 4 was great. I was up and rolling and really having fun. I was in character with Jason and starting to develop a fondness for him. I enjoyed getting the kid's letters and even wrote to a couple and asked them to write back to me and tell me their dog's name etc. One letter was quite sad, about a recently deceased pet dog, and I felt Jason could identify with how he would feel if his dog died and maybe in some small way help the grieving of that child --Who knows? I enjoyed the freedom of the character and talking in an eight year-old way to the kids - don't show this to any psychiatry colleagues!

Even the way this is written reflects the freedom experienced when the technology begins to turn invisible and the task becomes the focus of attention. Letters I receive at this stage are longer and the students talk about their family and leisure time pursuits in addition to their involvement in the task.

Stage 5: Adaptation to other contexts

Stage 5 - I started to think about how I could use [e-mail] in my job -perhaps to contact authors etc. I can see that it will be possible to use [e-mail] to communicate with other teacher-librarians etc. Is there a directory of users available ?

Here Pat is moving beyond the immediate task and exploring the potential for relevant use of e-mail in other aspects of her job as a media specialist in a school. By now the technology is invisible and only a vehicle through which the wider world can be reached for personal professional development and for the benefit of student learning.

Stage 6: Creative Application to New Contexts

(Stage 6).
Thanks for the opportunity to [e-mail] I have enjoyed it and it has given me a common experience to share with my student colleagues in the oft' lonely land of external study. Cheers, Pat.

Being a member of an e-mail team has had a side benefit where colleagues have been brought together and shared problems and so come to know each other. In the future they may continue to be in touch through e-mail and so a network of professional communication has commenced.

Pat can not reflect on Stage Six yet as, by its very nature, it will not be evident until some time after this project is ended. Then Pat may find she wants to achieve a particular vision and e-mail will be the most obvious way to achieve it. During the semester I have received requests for extensions and clarification related to assignments for other courses from students who were originally introduced to e-mail as a Character-on-Line.

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While many students reported concluding the project with positive computer learning and less anxiety, no formal measure of computer anxiety either pre or post project was administered. Some students chose not to write about their learning in relation to the six stages. No close record was kept of students who claimed to be anxious at the beginning and their outcome comments at the end. As with many e-mail messages the request for information is often not responded to. It could be possible that students not reporting their computer experiences were either still anxious or the technology was so invisible they did not consider reporting to be of any consequence.

CONCLUSION

The six stages of learning to use a new technology has been validated through this study. The students seem to jump the hurdle of the computer anxiety in order to put their minds to the authentic task of being a character in a book and writing letters to real students in schools across Australia.

This empirical study is as applicable for teachers of computer anxious learners as it is for the learners themselves. Four recommendations are suggested for instructional designers of courses for naive computer users:

1. Use a novel relevant real-life task to encourage the student to jump the hurdle of the processes in order to become involved in the task. Leso and Peck (1992) found students learning word-processing and other tool skills likely to be less computer anxious at the end of the course. However, they still found a third of these students measured high on the computer anxiety scale. Perhaps a pre and post computer anxiety measurement where the course included a novel and relevant or authentic task as an outcome would find a lower number of computer anxious students at the completion of the task.

2. Introduce the six stages for learning a new technology to students before they commence a computer course. Frequently students report feeling inadequate and stupid and expect to be experts with their first computer experiences. Through knowing the stages they may relate to the frustrations of previous students and remove some of the pressure to be perfect at the first attempt. Knowledge that they will eventually succeed as other students have done can remove some of the stress.

3. Provide a non-threatening environment with extensive technical and moral support during Stages Two and Three when self-esteem can be low and problems are not easily solved by a naive learner. McInerney et al. (1994) suggested students develop confidence if the learning environment is non-threatening. At this time there is a need for mediation and coaching. It is preferable for a non-threatening expert to be readily available on site, but, if this is not possible, telephone contact with the teacher or another expert is appropriate. However, when students are unable to contact an expert they find solace and problems are solved through talking or e-mailing with a student colleague who is learning the same processes. It seems a learning community can be developed which builds confidence and understanding in all members of that group. This idea parallels Dede's suggestion (in O'Neil, 1995) of students sharing a 'synthetic world'.

4. Encourage students to articulate their metacognitive experiences in relation to the six Stages. When students verbalize their learning, they can identify where they have come from, where they are now and the vision of success. The act of interacting with the six stages in order to clarify their own learning situation objectifies their learning and may remove negative subjective thoughts.

In the future the technological processes may not be electronic mail, but another technological innovation which needs learning through coaching and support with frustrating and time consuming focus on the processes before the technology invisibly becomes incorporated within an environment. Only then can creative and worthwhile uses be applied in a variety of contexts.

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